



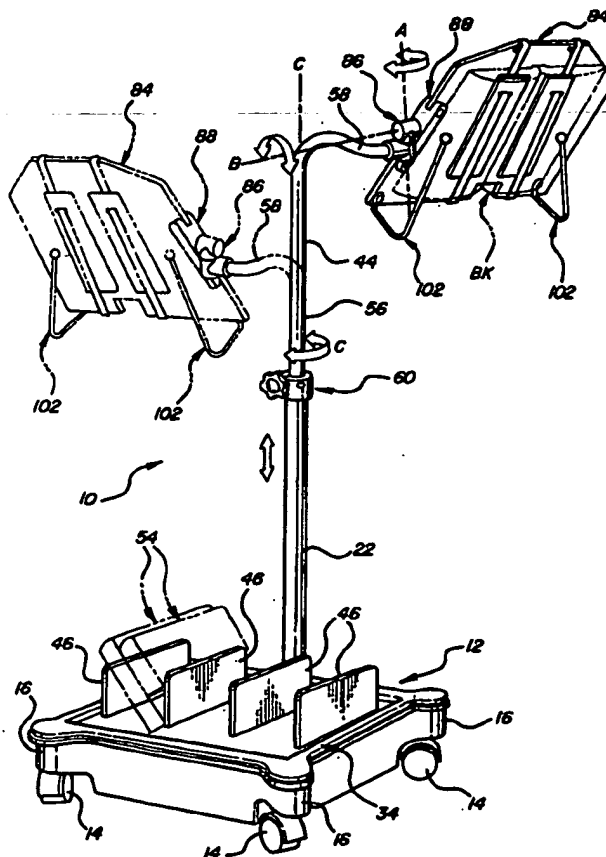
INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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(21) International Application Number: PCT/US98/17807 (22) International Filing Date: 27 August 1998 (27.08.98) (30) Priority Data: 60/056,583 27 August 1997 (27.08.97) US (71) Applicant: MIND TO MARKET, INC. [US/US]; 47730 Romeo Plank, Macomb Township, MI 48044 (US). (72) Inventors: RUCINSKI, Philip, J.; 47730 Romeo Plank, Macomb Township, MI 48044 (US). SIMON, David, F.; 47730 Romeo Plank, Macomb Township, MI 48044 (US). (74) Agent: BENEFIEL, John, R.; Suite 100 B, 280 Daines Street, Birmingham, MI 48009 (US).		(81) Designated States: AU, CA, JP, European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE). Published <i>With international search report. Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.</i>

(54) Title: BOOK HOLDER ASSEMBLY

(57) Abstract

A book holder assembly (10) is described including a vertical lower tube (22) mounted to a counterweighted base (12) also usable as a book storage space, or alternatively the lower tube (22) is provided with a clamp (136) enabling clamping to a desk top. An upper tube (44) is telescoped to the lower tube (22) to allow a height adjustment, and angled arm portion (58) of the upper tube (44) connected to a planar book shelf (84) by a swivel joint connection (86) which allows swinging rotation of the book shelf (84) as the upper tube (44) is swung in the lower tube (22) to maintain perpendicularity to the line of sight of the reader. Complete 360° tilt pivoting of the book shelf (84) is also allowed by the swivel joint connection (86). A book held on the book shelf (84) by straps (92) and spring finger page holders (102) may be set in position by various rotational movements of the upper tube arm (44) and swivel joint connection (86).



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BOOK HOLDER ASSEMBLY

Background of the Invention

This invention concerns book holders of the type able to hold an opened book in a convenient position for reading so that a person does not have to support the book while reading.

There have been a number of designs proposed for use with by reader reclined in bed or seated on a couch or chair, but none of these have been completely satisfactory.

Such a book holder should be relatively compact and uncomplicated, but able to stably hold the book in a wide variety of positions, and the desired position should be able to be set by the user quickly and easily.

U.S. Patent No. 3,514,066 describes a book holder swingable on a vertical support post. The holder can also be pivoted to face downwardly. The swinging movement allows adjustment of the holder position, but the angle of the book with respect to the reader's line of sight changes with the swinging movement, to limit the extent that the holder can be moved towards or away from the reader. Also, adjustments require loosening and tightening set screws, so that making such adjustments is slow and requires the use of tools.

U.S. Patent No. 500,715 shows a holder which allows ready position adjustments, but does not allow a tilting adjustment of the book.

U.S. Patents 5,772,174, 2,049,873 and 208,039 all describe a double linkage swinging adjustments for a book holder which does allow the book to be maintained flat to the line of sight of the reader as the holder is moved towards or away from the reader. However, the overhang condition created by two elongated links requires heavy, sturdy links or limits the weight able to be supported. These designs also do not allow 360° tilting of the holder.

Another problem is in providing an ability to readily turn the pages of a held book. Many designs clamp the entire book from the top, making page turning a very cumbersome process.

1 Another approach is to use a series of sets of spring fingers as described in
2 U.S. Patent 3,514,066 and also U.S. Patent 3,952,989, but this requires manipulation of a
3 number of fingers in turning the pages. The spring fingers lie almost flat to the page to
4 obscure the text and make freeing and retucking the pages a tedious exercise.

5 Many of these designs use a vertical support post held by a base structure,
6 such as seen in U.S. Patent Nos. 2,771,705; 1,017,698; 5,351,927; and 2,193,907. These
7 base structures have legs which occupy considerable floor area in order to be able to
8 support heavy books without tipping, thus getting in the way of foot traffic.

9 An object of the present invention is to provide a compact book holder
10 assembly which is capable of enabling a swinging position adjustment of a book holder
11 while maintaining a book orientation be perpendicular to the line of sight of the reader
12 and also allowing a 360° tilt pivoting of the holder about a horizontal axis, and in which
13 ready, convenient position adjustments may be quickly made by the user without the use
14 of tools.

15 Another object is to provide a book holder assembly with a compact
16 support, base providing a stable support, and which base is also usable for book storage.

17 A further object is to provide a book holder with page holding finger
18 elements which allow easy page turning while accommodating various book sizes.

19

20 Summary of the Invention

21 These objects and others which will be appreciated upon a reading of the
22 following specification and claims are achieved by telescoped upper and lower tubes.
23 The upper tube has an outwardly angled arm portion to which is mounted a book
24 supporting shelf, by means of a swivel joint connection, installed on the end of the arm
25 portion. The book supporting shelf has a bracket attachable to either side with a tilt pivot
26 pin projecting from the bracket held in a horizontal axis socket formed in a swivel joint
27 piece included in the swivel connection joint. A vertical axis swing pin is fixed to the
28 swing joint piece, and is inserted in a swing axis socket affixed to the end of the upper
29 tube arm, the swing axis pin rotatable therein to allow an articulation between the upper
30 tube arm and the book holder shelf as a vertical section of the upper tube is rotated in the

1 lower tube. This allows the book holder shelf to remain perpendicular to the reader's line
2 of sight as the holder is moved towards or away from the reader. At the same time, the
3 rotatable connection to the shelf bracket provided by the tilt pivot pin and socket allows
4 the shelf to be pivoted 360° to be tilted to any desired angle. Each of the rotary
5 connections have sufficient friction to hold a selected position without the use of set
6 screws or the like.

7 An adjustable connection may also be provided allowing positioning for
8 sideways reading by the user.

9 The book holder shelf is preferably constructed of a flat sheet of clear
10 plastic, and has a pair of encircling straps secured (as with a Velcro connected) and
11 extender plates mounted thereto allow secure retention of light weight book covers, even
12 when inverted.

13 A pair of wire form page holder fingers are pivotally attached to the
14 bottom corners of the shelf, the end of each finger having a soft rubber ball affixed
15 thereto to engage the book pages and hold the book in an opened condition while
16 allowing easy turning of the individual pages. The pivotal attachment allows the page
17 holder finger ends to be swung to accommodate a range of book sizes, and the fingers are
18 formed to provide clearance for large books, and to minimize obscuring the text on the
19 held page.

20 The base is a low, compact, box like platform, containing water filled
21 plastic bags as a counterweight material added by the user to prevent tipping induced by
22 the weight of heavy books held on the shelf, when the upper tube arm is positioned to be
23 extended away from the base. An upper surface is adapted to store books, with
24 detachable divider plates inserted in the upper surface. Roller casters are mounted to
25 projecting ear portions at the corners to increase the stability of the assembly while
26 minimizing the bulk thereof. The upper tube arm portion can be extended either over or
27 away from the base.

28 A clamp on version of the invention is also possible, in which a clamp is
29 attached to support the lower tube on a desk top, bed frame, etc.

30

1 Description of the Drawing Figures

2 Figure 1 is a perspective view of a first embodiment of the book holder
3 assembly according to the present invention, with movement of the book shelf indicated
4 in phantom lines.

5 Figure 2 is an enlarged perspective view of the book holder shelf and
6 fragmentary portions of the main tube, shown supported from the swivel joint connection.

7 Figure 2A is a fragmentary section having a portion of the shelf shown in
8 Figure 2.

9 Figure 3 is an enlarged exploded view of the components of a coupling
10 connection between the upper and lower tubes, shown in fragmentary form.

11 Figure 4 is an enlarged inverted perspective view of a portion of the
12 bottom of the base platform, showing details of the connection between the lower bottom
13 tube end and the base.

14 Figure 5 is an exploded perspective view of the base included in the book
15 holder assembly shown in Figure 1, with a fragmentary portion of the lower tube.

16 Figure 6 is a sectional view taken through the swivel joint connection
17 included in the book holder assembly of Figure 1.

18 Figure 7 is a fragmentary side elevational view of a modified portion of
19 the swivel joint connection allowing an adjustment of sideways orientation of the book
20 holder shelf.

21 Figure 7A is a plan view of the modified swivel joint connection shown in
22 Figure 7.

23 Figure 8 is a fragmentary side view of the lower tube of an alternate
24 embodiment using a clamp on connection to a desk top, table or bed frame.

25

26 Detailed Description

27 Referring to the drawings, a first embodiment of the book holder assembly
28 10 according to the invention includes a base 12, comprised of a box-like platform
29 supported for rolling movement on a series of swivel caster rollers 14, each mounted on

1 an ear protuberance 16 at each corner of the base 12. This arrangement provides a wider
2 support stance defined by the spacing of the caster rollers 14 to better resist tipping.

3 The interior 20 of the base 12 contains a mass of counter weighting
4 material, which is preferably comprised of a plurality of flexible plastic bags 18 filled
5 with water (Figure 5). This allows easier shipping of the holder assembly 10, with two or
6 more bags affording easier handling than a single heavier bag.

7 The book holder assembly 10 includes a lower tube 22 detachably
8 mounted to the base 12 to extend vertically up from one side of the top 24 of the base 12.
9 The bottom end of the tubes 22 is received in an opening 26 in the base top 24 (Figure 5),
10 with a fixed ridge 28 resting in a counterbore 30 to support the weight. A socket 32 is
11 fixed within a bottom 34 of the base 12 and receives the bottom end of the lower tube 22
12 protruding through the top 24, to stabilize the tube 22 in its vertical orientation. A cross
13 hole 36 receives a cotter pin 38 inserted through holes in the bottom end of the lower tube
14 22. Recesses 40A, 40B (Figure 4) in the bottom wall 34A of the base 12 allow access to
15 install and remove the cotter pin 38. Connecting slot 42 captures the cotter pine 38 to
16 prevent rotation of the lower tube 22.

17 The base 12 also is provided with removable dividers 46 inserted in slots
18 50 in the base top 34, which is held with a screw as shown. A surface 52 of the top 34 is
19 recessed so as to confine books 54 placed between the dividers.

20 The base 12 is preferably of a suitable molded plastic such as ABS.

21 The upper tube 44 includes a straight vertical section 56 telescoped in the
22 lower tube 22 to be slidably adjustable to raise or lower an outwardly extending arm
23 portion 58 formed at an angle to vertical section 56 lie generally horizontally. A slight
24 downward dip is formed in the arm portion 58, as shown, to allow a greater range of
25 vertical adjustment of the supported book holder (described below).

26 The upper tube 44 is adjustable vertically as noted, and can be clamped in
27 any adjusted vertical position by a clamp 60 which fixes the adjusted vertical position of
28 the tube 44. The clamp 60 allows rotation of the upper tube 44 in the lower tube 22 by
29 slippage of the clamp 60 with respect to the lower tube 22, this slippage generating a
30 frictional resistance which stabilizes the tube 44 in any rotated position.

1 The clamp 60 comprises separate clamp halves 62, 64 (Figure 3) having
2 complementary semicircular recesses 66, 68 sized to grip the exterior of the tube 44 when
3 the clamp halves 62, 64 are drawn together by tightening of a screw 70 extending through
4 aligned holes and having a nut 72 threaded thereonto, and advance of a threaded pin 74
5 extending through aligned holes and having a nut 74 threaded thereonto, pin 74 attached
6 to knob 76.

7 Semicircular grooves 78 in each of the clamp halves 62, 64 capture a bead
8 80 fixed on the upper end of the lower tube 22 as the halves 62, 64 are drawn together.
9 As the recesses 66, 68 seat firmly on the outside of the tube 44 to be clamped fixedly
10 thereto, the grooves 78 capture the bead 80 but do not tightly grip the same so as to allow
11 rotation of the tube upper 44 in the lower tube 22. A predetermined frictional drag is
12 desirable so that a selected position will be maintained even though adjustment positions
13 may be made easily.

14 An O-ring 82 can be installed in the grooves 78 to increase this friction, if
15 necessary.

16 A generally planar book shelf 84 is mounted to the end of the outwardly
17 extending arm portion 58 of the upper tube 44 by means of a bracket 88 and a swivel
18 connection joint 86 allowing swinging of the shelf 84 in a horizontal plane about a
19 vertical axis "A", as well as tilt pivoting through 360° about a horizontal axis "B".

20 The book shelf 84 is preferably of a stiff transparent plastic of sufficient
21 thickness (i.e., 5 mm) to support the weight of a heavy book, with angled upper corners,
22 both characteristics minimizing the size impression presented by the shelf 84.

23 A series of flattened protrusions 90 are arranged along the bottom of the
24 front surface of the book shelf 84 to provide a rest for the bottom edge of a supported
25 book held against the front surface. Rear pegs 91 (Figure 2A) can be provide protruding
26 from the rear face to hold documents when the shelf is intended for viewing through the
27 plastic.

28 A center cut out 95 allows gripping of documents on either side of the
29 shelf 84. A pair of attachment straps 92 encircle the central portion of the shelf 84, and
30 through slots 94 in respective stiff stabilizer plates 94. The plates 96 act to support the

1 thin covers of magazines, etc., when inverted. Also, when particularly thick books are
2 held, a number of pages can be placed below the straps 92 and plates 94 to prevent
3 overloading of the spring fingers 102. In this case, the plates 94 will assist in confining
4 those pages. The slots 94 are offset as to allow positioning closer or further apart to adapt
5 to small or larger sizes.

6 The bracket 88 is attachable to either side using a predrilled hole pattern
7 98 and recess 100 on each side thereof.

8 A pair of thin steel rod spring fingers 102 each have one end 104 pivotally
9 mounted to a respective lower corner of the shelf 84, below the level of the upper sides of
10 the protrusions 90 to be clear of the lower edge of a held book.

11 A first short segment "X" of each finger 102 extends down and away from
12 the corner to provide clearance from the outer edges of the largest books. A second
13 segment "Y" extends perpendicularly out of the plane of the shelf 84 to accommodate the
14 thickness of a held book but also to position an end segment Z so as to extend back
15 towards the plane of the shelf 84 at an acute angle. A ball 106 of a soft elastomeric such
16 as neoprene rubber is affixed to each tip. Each of the balls 106 engages the side margin
17 of the page of the opened book B (Figure 1), holding the book open without obscuring the
18 copy being read. The soft neoprene ball 106 creates a high frictional engagement
19 preventing the pages from slipping out, even when the holder is inverted. The spring
20 force generated by deflection of fingers 102, mainly of end segment Z, effectively secures
21 the book B in the open position in any pivoted position of the shelf 84, even an inverted
22 position.

23 At the same time, the balls 106 can be easily lifted slightly when turning
24 the pages. Also, the pages can also be merely slipped out without lifting of the balls 106
25 due to the frictional characteristics of the balls 106. The segments Z can be swept in and
26 out by pivoting at 104 to be adjusted to different book sizes.

27 The configuration of the fingers 102 minimizes visual interference, and
28 allows easy page turning. The swivel joint connection 86 includes a swing axis socket
29 piece 108 fixed to the end of the upper tube arm 58, providing a vertical axis socket 110.

1 A swing pin 112 is integral with a swivel joint piece 114 and is removably received in the
2 socket 110.

3 The piece 114 also includes a pivot axis socket 118 extending
4 orthogonally to the swing axis pin 112, i.e., generally horizontally, but at a slight upward
5 angle ("A") thereto as seen in Figure 6A. The angle is selected so that the weight of an
6 average book (i.e., 2½ lbs.) will cause the upper tube arm 58 to sag into an approximate
7 horizontal position.

8 The bracket 88 has a pivot pin 120 integral therewith received in the pivot
9 socket 118 to be rotatable therein.

10 A retainer screw 122, accessed through the hollow swing pin 112, is
11 advanced in a threaded hole in side wall of the socket 118 to be received in a groove 124
12 in the pin 120 to capture the same while allowing free rotation.

13 A sufficient frictional engagement is desirable to maintain an adjusted
14 position while allowing easy movement of the parts. This is provided by a molded plastic
15 construction of these parts, as of Nylon.

16 Thus, the book shelf 84 and book can be positioned by rotation about axis
17 A and B as well rotation of the upper tube 44, defining a third axis "C". The swing axis
18 A allows the plane of the shelf 84 to remain perpendicular to the reader's line of sight as
19 the tube 58 is rotated about axis C to be positioned nearer or further from the reader.

20 Figures 7 and 7A show an optional construction of the swivel connection
21 joint 86A, for resetting the shelf position at right angles to allow reading while lying on
22 one's side.

23 This includes a swivel joint piece 114A of two parts, a first part 126
24 formed with the swing pin 112A fit in socket 110A. A round toothed portion 128 is
25 adjustably fit to a second toothed portion 130 of a second port 132, having the pivot
26 socket (not shown) formed integrally therewith. A screw holds toothed portions securely
27 in face to face engagement in an adjusted position. This allows a resetting of the book
28 shelf to extend downwardly from the tube segment at right angles, allowing a person to
29 read a book while lying on his or her side.

1 The book holder assembly can also be held by a clamp 136 welded to the
2 lower tube 22A, as seen in Figure 8. The clamp 136 is used to secure the tube 22A to a
3 desk top, bed frame, etc., in lieu of the support provided by the base 12.

4 The book holder assembly 10, as described, is relatively simple and
5 compact and allows quick and easy adjustment of the position of a held book, with many
6 positions offered by the 360° rotation about the three axes.

7 The clamp 60 allows the holder 10 to be configured in either a
8 cantilevered "Z" position, with the arm 58 extending away from the base 12, or in an
9 overhanging "U" shape, with the arm 58 extending over the base 12. The base 12 is low
10 enough so it can be disposed beneath a bed, after removal of the books and dividers.

11 The counterweighted base provides a compact but stable support in the
12 cantilevered "Z" position of the book holder. The base has a handsome appearance to be
13 compatible with fine home furnishings. The base may be quickly reconfigured for a
14 beneath the bed location or to be positioned along side a bed or chair. Even heavy weight
15 books are held securely and pages able to conveniently be turned.

1 Claims

2

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1. A book holder assembly comprising:

4

a lower tube adapted to be supported vertically;

5

an upper tube having a straight section telescoped to said lower tube to
allow vertical adjustment, said upper tube including an arm portion projecting generally
horizontally to the side of said lower tube, able to be swung by rotation of said upper tube
with respect to said lower tube;

9

a swivel joint connection mounted to the end of said upper tube arm
portion, , said swivel joint connection including a swing socket, a swing pin rotatably
received in said socket, a tilt pivot pin projecting laterally with respect to said swing pin,
and a tilt pivot socket rotatably receiving said tilt pivot pin;

13

a generally planar book shelf connected on one side to said swivel joint
connection and able to be swung forward and backward by said rotation of said upper
tube with respect to said lower tube while maintaining a perpendicular orientation to the
line of sight of a reader orientation by rotation of said swing pin in said swing socket, and
to be tilted about a horizontal axis defined by said tilt pivot pin and socket; and,

18

book holding means adapted to hold an opened book on said book shelf.

19

20

2. The book holder assembly according to claim 1 wherein said book

21

holder means includes a pair of spring page holder finger elements, each element pivoted
at one end to said book shelf at a lower corner thereof, and each element having an angled
opposite end projecting towards a front side of said book shelf.

24

25

3. The book holder assembly according to claim 2 wherein a soft

26

rubber ball is affixed to a tip of said angled end of each of said spring fingers adapted to
frictionally engage a respective book page.

28

29

4. The book holder assembly according to claim 3 wherein each

30

spring finger element has a mounting segment extending away from a bottom edge of

1 said book shelf, said angled end extending back towards said book shelf at an acute angle
2 to said book shelf.

3

4 5. The book holder assembly according to claim 4 wherein said
5 mounting segment includes a portion extending outwardly from an adjacent side edge of
6 said book holder.

7

8 6. The book holder assembly according to claim 1 wherein said book
9 holder means includes a pair of straps passing over said front surface of said book shelf,
10 each having a wider plate affixed thereto to better support lighter weight book covers and
11 pages disposed beneath said pages.

12

13 7. The book holder assembly according to claim 1 wherein said book
14 shelf is constructed of transparent material.

15

16 8. The book holder assembly according to claim 7 wherein a central
17 notch extends up from a bottom edge of said book shelf.

18

19 9. The book holder assembly according to claim 1 wherein said
20 swivel joint connection includes a bracket adapted to be attached to either of opposite
21 side edges of said book shelf.

22

23 10. The book holder assembly according to claim 9 wherein said tilt
24 pivot pin is fixed to said bracket.

25

26 11. The book holder assembly according to claim 10 wherein said
27 swivel joint connection includes a unitary swivel joint piece comprised of said tilt pivot
28 socket and said swing pin extending along respective mutually perpendicular axes.

29

1 12. The book holder assembly according to claim 1 wherein said lower
2 tube is held in a base comprised of a box-like platform.

3

4 13. The book holder assembly according to claim 11 wherein said base
5 is hollow and contains a volume of counterweight material.

6

7 14. The book holder assembly according to claim 13 wherein said
8 material comprises one or more water filled bags.

9

10 15. The book holder assembly according to claim 12 wherein said base
11 has a top formed with a flat recessed surface defined by a raised perimeter.

12

13 16. The book holder assembly according to claim 15 further including
14 removable divider plates each inserted in a plurality of parallel spaced slots in said
15 recessed surface.

16

17 17. The book holder assembly according to claim 12 further including
18 ear portions protruding from each cover of said base, each ear portion supporting a caster
19 roller element.

20

21 18. The book holder assembly according to claim 12 wherein said
22 lower tube is removably attached to said base.

23

24 19. The book holder assembly according to claim 1 wherein said upper
25 tube arm portion is angled slightly up from the horizontal.

26

27 20. The book holder assembly according to claim 1 wherein said book
28 holder shelf is adjustably attached to said swivel joint connection to enable a more
29 downward inclination to be set.

30

1 21. The book holder assembly according to claim 11 wherein said
2 swing pin is unconnected to said swing socket to allow lift out removal of said swing pin
3 and said attached book shelf.
4

5 22. The book holder assembly according to claim 1 further including
6 clamping means for clamping said upper tube straight section to said lower tube, said
7 clamping means including a pair of clamping members and a bead on said lower tube
8 positively restrained axially by said clamping members as said clamping members are
9 drawn together by threaded elements included in said clamping means, said clamping
10 members engaging said upper tube straight section to prevent vertical movement, but
11 allowing rotation with respect to said bead, to allow rotation of said upper tube.
12

13 23. A book holder assembly comprising:
14 a generally rectangular box-like platform;
15 a lower tube mounted to project vertically up from said platform;
16 a mass of counterweight material disposed in said platform;
17 an upper tube having one straight section thereof telescoped to said lower
18 tube, an outer arm portion of said upper tube angled to extend generally horizontally from
19 said straight section;
20 a generally planar book shelf pivotally connected to an end of said arm
21 portion of said upper tube; and
22 book holder means for holding an open book on said book shelf.
23

24 24. The book holder assembly according to claim 23 wherein said
25 platform has a planar upper surface and further including a series of divider plates
26 removably mounted in said upper surface, allowing storage of books on said platform
27 upper surface.
28

29 25. The book holder assembly according to claim 23 wherein said
30 counterweight material comprises a plurality of bags filled with water.

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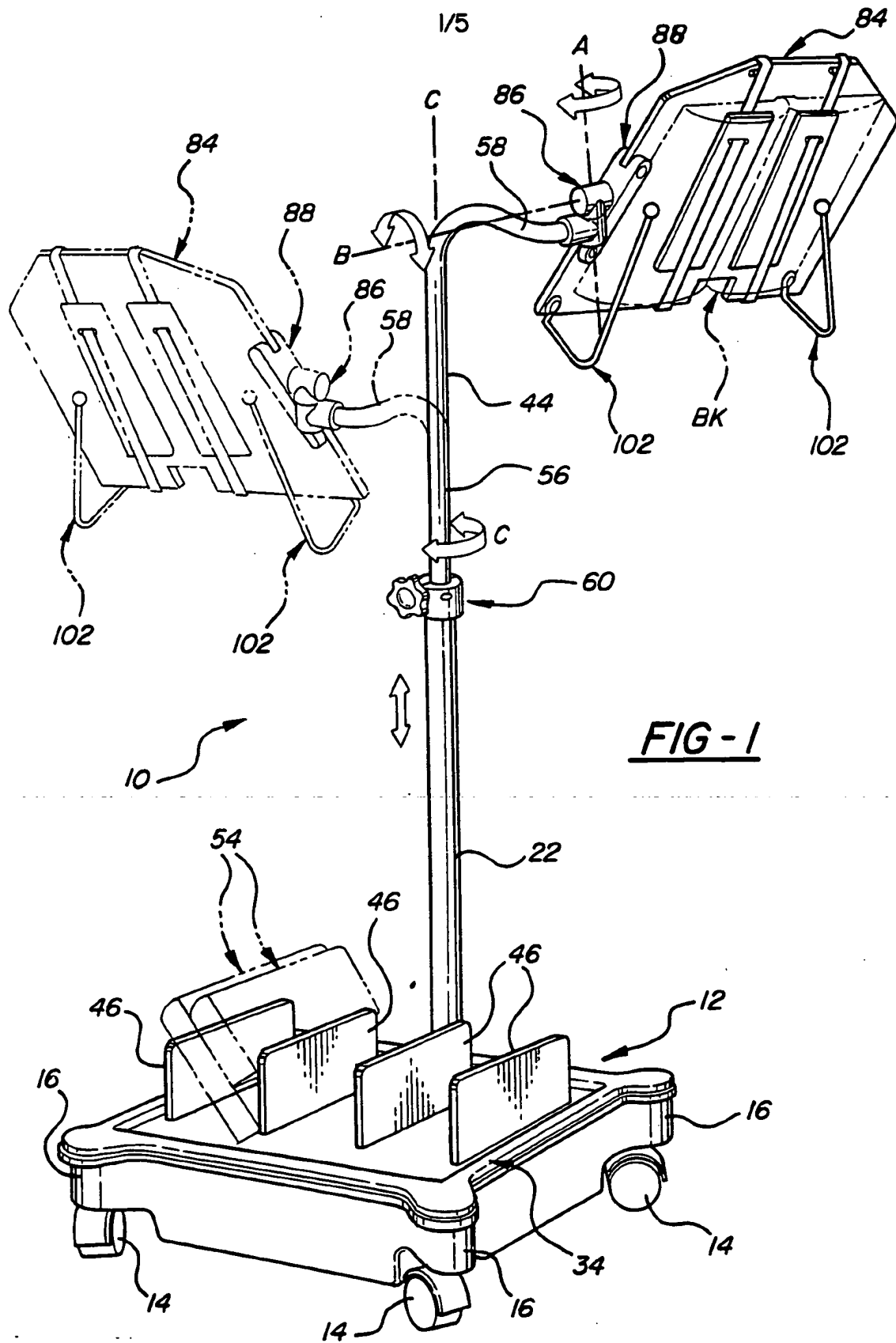
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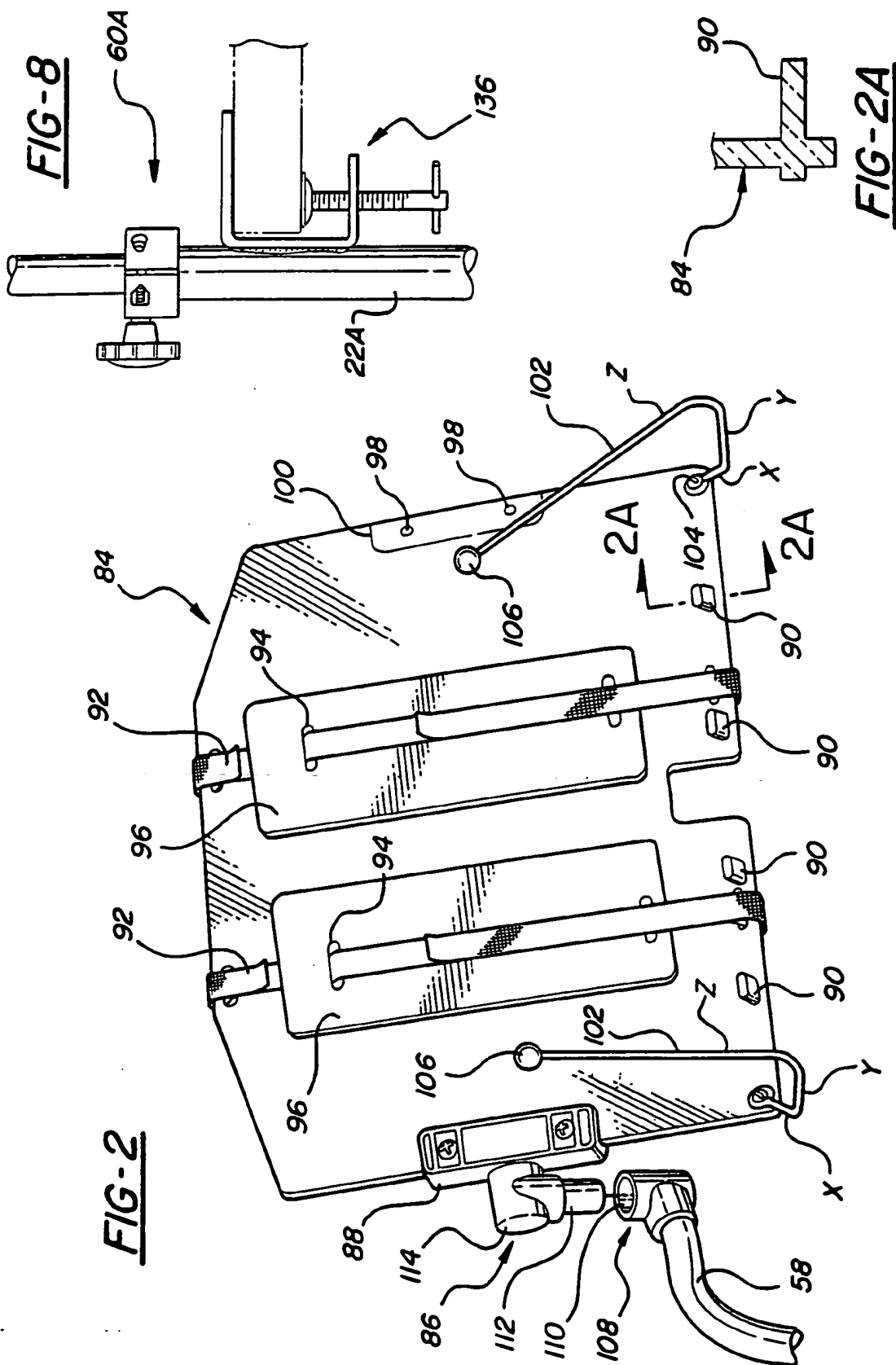
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26. The book holder assembly according to claim 23 further including an ear protuberance portion at each corner of said base, and a caster roller mounted to each ear protuberance portion.

27. The book holder assembly according to claim 23 wherein said lower tube is detachably mounted on one side of said platform.



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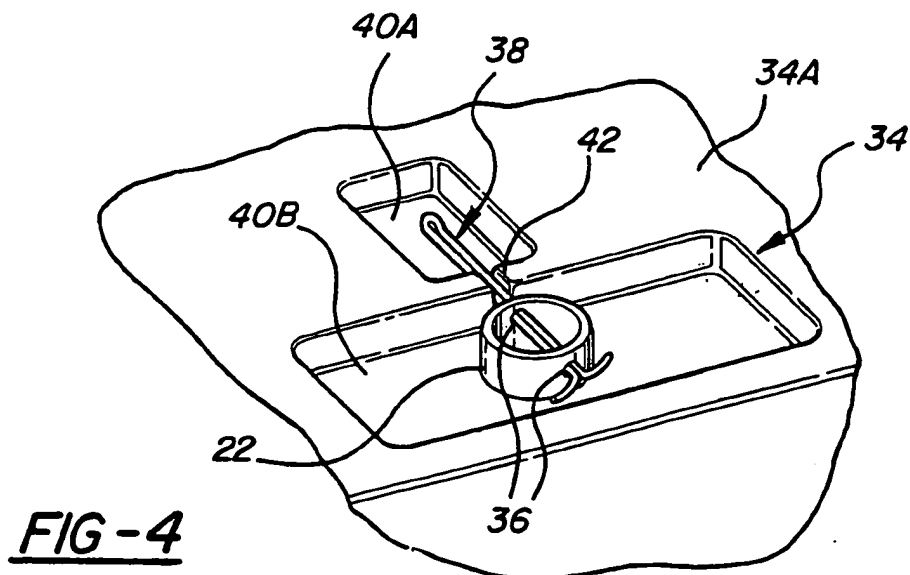
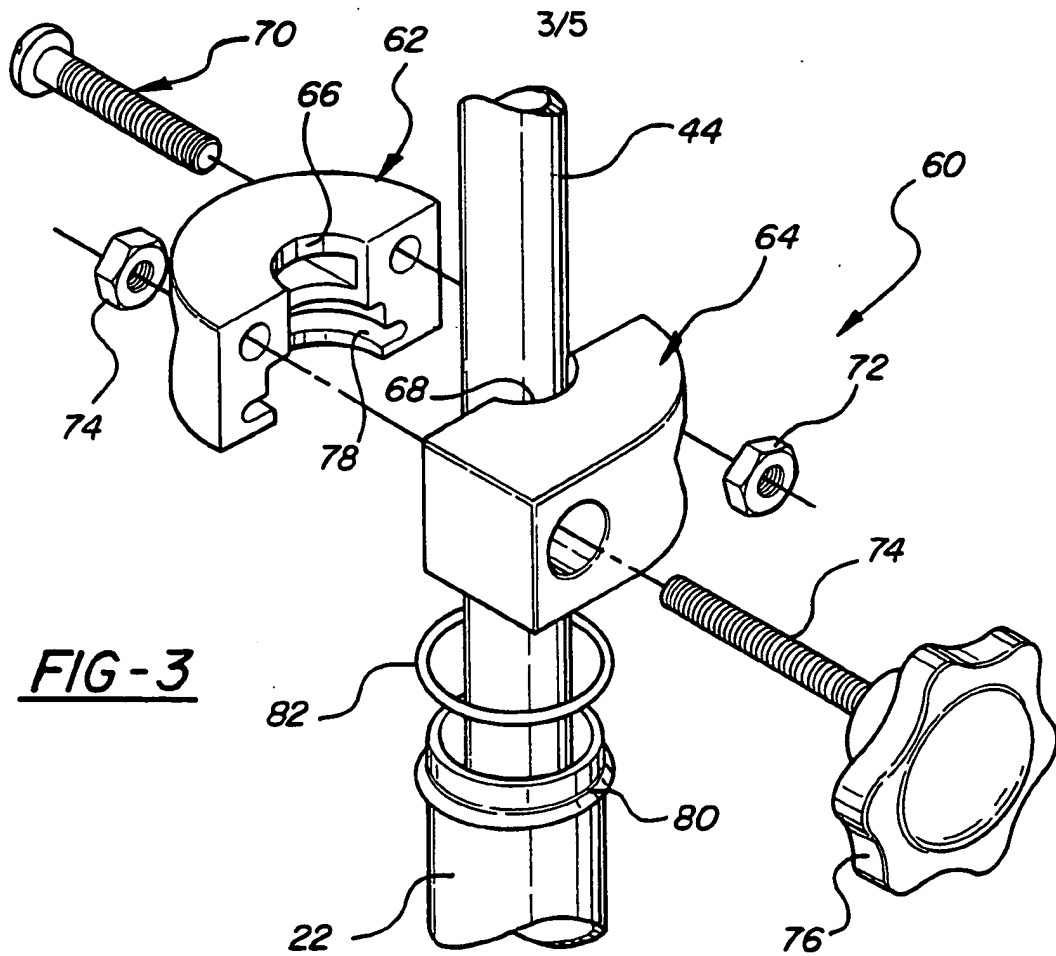
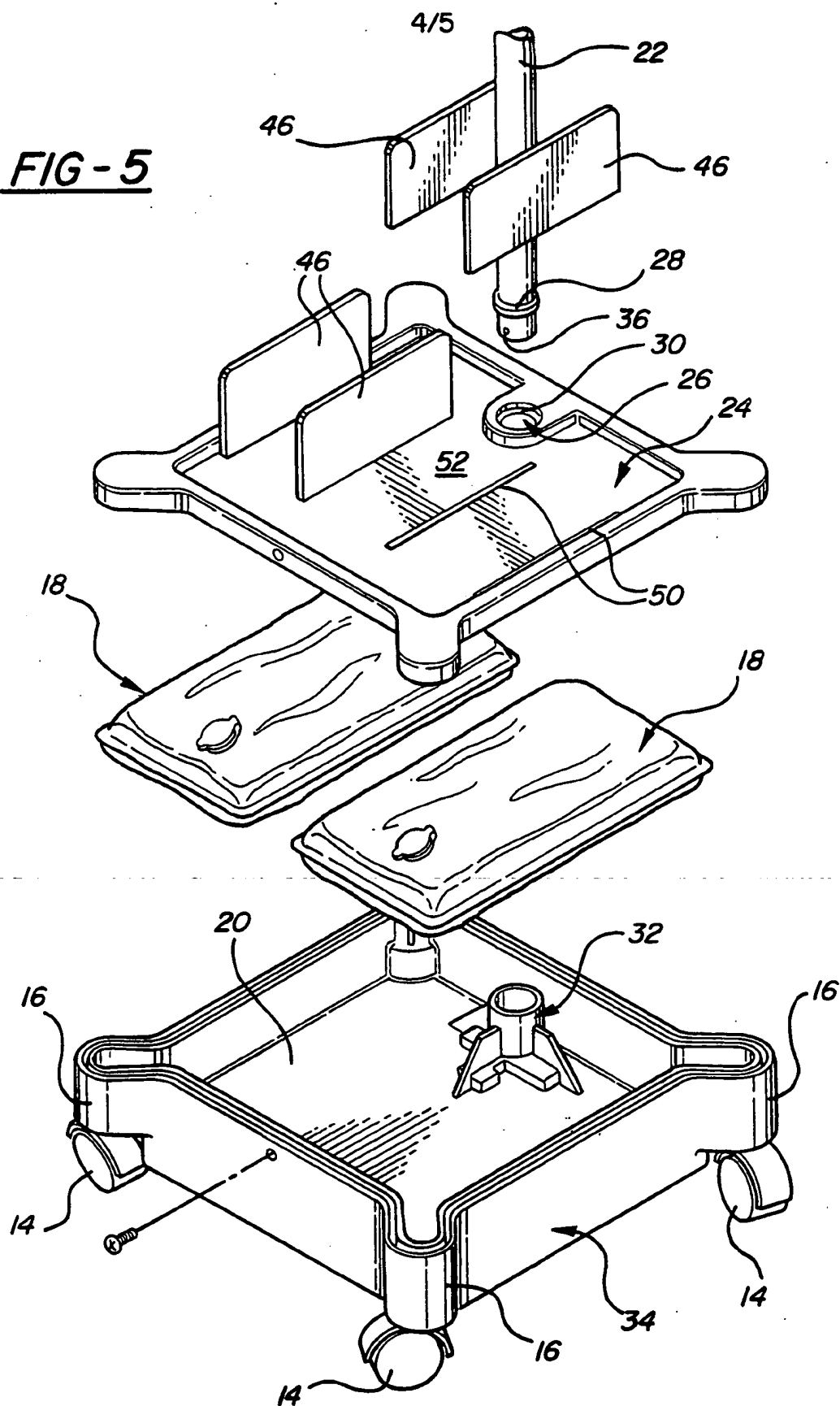
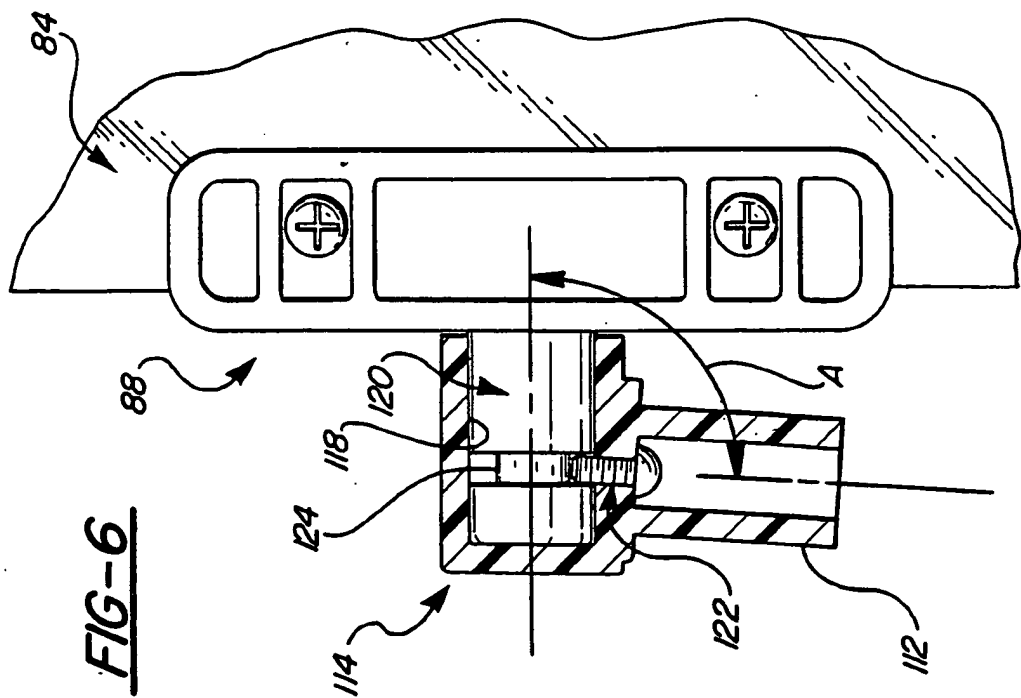
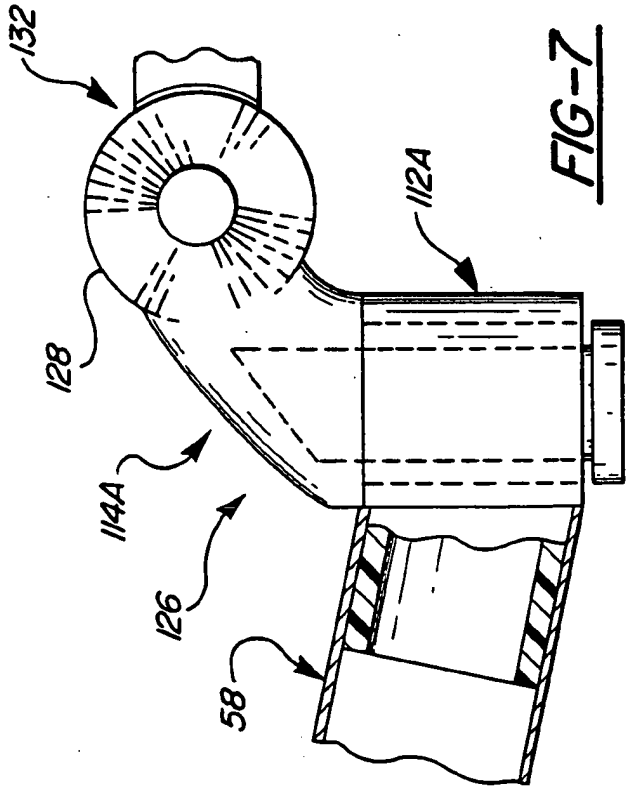
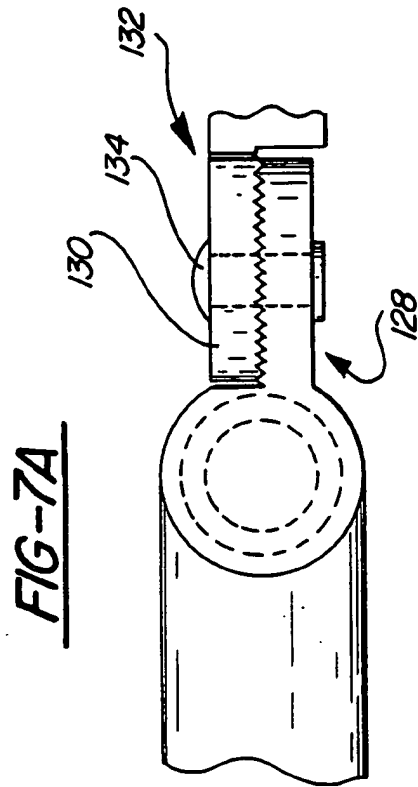


FIG - 5





INTERNATIONAL SEARCH REPORT

International application No.

PCT/US98/17807

A. CLASSIFICATION OF SUBJECT MATTER IPC(6) :A47B 19/00 US CL :248/441.1, 451, 453, 458, 346.2; 211/42 According to International Patent Classification (IPC) or to both national classification and IPC		
B. FIELDS SEARCHED Minimum documentation searched (classification system followed by classification symbols) U.S. : 248/411, 414, 441.1, 451, 453, 454, 458, 346.2, 910; 211/42 Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched NONE Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) NONE		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 919,923 A (MCNATT) 27 April 1909, (27.04.09) see Fig. 1.	1-14, 17-23, 25-27
Y	US 5,351,927 A (HOWELL) 04 October 1994 (04.10.94), see Fig. 2.	1-14, 17-23, 25-27
Y	US 3,952,989 A (BANNISTER HATCHER) 27 April 1976 (27.04.76), see Fig. 1.	2-5
Y	US 5,259,581 A (GOLDBERG) 09 November 1993 (09.11.93), see Figs. 6a,6b.	9-11
Y	US 5,161,766 A (ARIMA) 10 November 1992 (10.11.92), see entire document.	7
Y	US 4,296,693 A (ARCHER) 27 October 1981 (27.10.81), see entire document.	12-14, 17, 18, 23, 25-27
<input checked="" type="checkbox"/> Further documents are listed in the continuation of Box C. <input type="checkbox"/> See patent family annex.		
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Date of the actual completion of the international search 04 NOVEMBER 1998		Date of mailing of the international search report 24 DEC 1998
Name and mailing address of the ISA/US Commissioner of Patents and Trademarks Box PCT Washington, D.C. 20231 Facsimile No. (703) 305-3230		Authorized officer DEREK J. BERGER Telephone No. (703) 308-2954

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US98/17807

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 2,442,081 A (FAUST) 25 May 1948 (25.05.48), see Fig. 3.	18
A	US 2,118,151 A (BROCKWAY) 24 May 1938 (24.05.38), see entire document.	16, 24
A	US 4,074,451 A (JACOBSON et al.) 21 February 1978 (21.02.78), see Fig. 1.	16, 24

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